



15 AIR 11700

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Zheng et al. Examiner: Brown, C.  
Serial No.: 09/437,006 Group Art Unit: 1765  
Filed: November 9, 1999 Docket No.: PHA 51219  
(VLSI.268PA)  
Title: ETCH PROCESS THAT RESISTS NOTCHING AT ELECTRODE  
BOTTOM

CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence and the papers, as described hereinabove, are being deposited in the United States Postal Service in triplicate, as first class mail, in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231, on November 11, 2002.

By: Erin M. Nichols  
Erin M. Nichols

APPEAL BRIEF

Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

This is an Appeal Brief submitted pursuant to 37 CFR §1.192 for the above-referenced patent application and is being filed in triplicate.

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I. Real Party in Interest

The real party in interest is Philips Electronics North America Corporation, having a place of business at 580 White Plains Road, Tarrytown, New York. The above referenced patent application is assigned to VLSI Technology, Inc., which is now a part of Philips Electronics North America Corporation. Koninklijke Philips Electronics N.V., a corporation having an office and place of business at Groenwoudseweg 1, 5621 BA Eindhoven, The Netherlands, has a direct or indirect interest in each of the above-mentioned corporate entities.

II. Related Appeals and Interferences

There are no related appeals or interferences.

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### **III. Status of Claims**

Claims 1 and 3-21 are being presented for appeal. Claims 1 and 3-21 stand rejected under §103(a) as being obvious over *Grimbergen et al.* (U.S. Patent No. 6,081,334) in view of *Witek et al.* (U.S. Patent No. 5,627,395). The claims presented for appeal, as presently amended, may be found in the attached Appendix of Appealed Claims.

### **IV. Status of Amendments**

The application was initially filed on November 9, 1999, including claims 1-21. In reply to the first Office Action mailed on September 21, 2000, a Response to Office Action was filed on December 21, 2000, *inter alia*, amending independent claim 1 and dependent claim 4 and canceling claim 2. A second Office Action was mailed on March 8, 2001, and in reply an Office Action Response was filed on June 1, 2001. In reply to an Advisory Action mailed on June 20, 2001, an Advisory Action Response was filed on July 2, 2001. In reply to a Final Office Action mailed on June 7, 2002, an Office Action Response After Final was filed via facsimile on August 7, 2002. An Advisory Action was mailed on August 15, 2002 maintaining the final rejections. A Notice of Appeal was filed via facsimile on September 9, 2002.

### **V. Summary of Invention**

Appellant's invention is directed to a process of forming a semiconductor device. In a particular embodiment, at least one device layer is formed over a wafer surface, and a mask is provided over a portion of the device layer. A plasma etch which includes first and second etching chemistries, is then used to selectively etch into the device layer to form a pillar structure having at least one sidewall. While some traditional etch processing gases have used excessive amounts of nitrogen (*e.g.*, well beyond twenty percent of the overall gas flow) as a gas flow carrier or as an enhancement to desirable passivation properties, the selective etch of the instant invention includes a subtle amount of nitrogen, less than about ten percent of gas flow, in the second etching chemistry as part of the plasma etch for the purpose of avoiding a notching effect without affecting the selectivity of the overall etching process.

In another embodiment, at least one device layer is formed over an underlying dielectric layer where both the device layer and underlying dielectric layer are formed over a

wafer surface, and a mask is provided over a portion of the device layer. A plasma etch which includes a first chemistry is used to selectively etch into the device layer to form a pillar structure having at least one sidewall. After the first chemistry plasma etch, a plasma etch of a different, second etching chemistry, which includes less than about ten percent nitrogen of the gas flow, is used to complete the selective etch upon etching up to the underlying dielectric layer.

Other embodiments vary from the above-described approaches, *e.g.*, by using as little as less than two percent nitrogen in the overall gas flow in the second etching chemistry, the mask being a hardmask, and the first chemistry including a selectivity booster.

## **VI. Issues for Review**

**Issue 1:** Is the §103(a) rejection of claims 1 and 3-21 proper when the Examiner failed to present correspondence between the instant invention and the proposed modification of the '334 reference and, therefore, failed to establish a *prima facie* case of obviousness?

**Issue 2:** Is the §103(a) rejection of the appealed claims 1 and 3-21 proper when the Examiner failed to clearly state the reasons for the rejection so as to be useful to Appellant in judging the propriety of the rejection, as required by 35 U.S.C. §132?

**Issue 3:** Is the §103(a) rejection of claims 1 and 3-21 proper when the Examiner failed to take note of Appellant's arguments presented in the Office Action Response filed on June 1, 2001 and answer the substance thereof, as required by M.P.E.P. §707.07(f)?

**Issue 4:** Is the §103(a) rejection of claims 1 and 3-21 proper when the Examiner failed to cite evidence of motivation for modifying the '334 reference or the proposed modification undermines the purpose of the '334 reference and, therefore, failed to establish a *prima facie* case of obviousness?

## **VII. Grouping of Claims**

The claims as now presented do not stand and fall together and are separately patentable for the reasons discussed in the Argument. For purposes of this appeal, the claims should be grouped as follows: Group I - claims 1, 4, 5, 18 and 21; Group II – claim 3; Group

III – claims 6 and 20; Group IV – claims 7 and 19; Group V – claims 8-10, 15 and 17; Group VI – claims 11, 12, and 14; Group VII – claim 13; and Group VIII – claim 16.

#### **VIII. Argument**

Appellant submits that the claims of groups I – VIII are patentably distinguishable from each other and from the cited prior art references. The claims in group I are patentable over the prior art, because they include subject matter that is not taught or suggested by any of the references cited. The claim of group II is separately patentable over the other claim groups because it is directed to subject matter that includes the use of nitrogen in the second etching chemistry in an amount less than about two percent of gas flow, which is not necessarily present in the other claim groups and not taught by the cited prior art. The claims of group III are separately patentable over the other claim groups because they are directed to subject matter that includes a mask which is a hardmask, which is not necessarily present in the other claim groups and not taught by the cited prior art. The claims in group IV are separately patentable over the other claim groups because they are directed to subject matter that includes a selectivity booster, which is not necessarily present in the other claim groups and not taught by the cited prior art. The claims in group V are separately patentable over the other claim groups because they are directed to subject matter that includes the use of nitrogen in the second etching chemistry in an amount less than ten percent of the gas flow for a function of completing the selective etch upon etching up to the underlying dielectric layer, which is not necessarily present in the other claim groups and not taught by the cited prior art. The claims in group VI are separately patentable over the other claim groups because they are directed to subject matter that includes a mask and the mask is a hardmask and the mask is formed from SiON, which is not necessarily present in the other claim groups and not taught by the cited prior art. The claim in group VII is separately patentable over the other claim groups because it is directed to subject matter that includes the first chemistry including HBr/Cl<sub>2</sub> and a selectivity booster, which is not necessarily present in the other claim groups and not taught by the cited prior art. The claim in group VIII is separately patentable over the other claim groups because it is directed to subject matter that includes the use of nitrogen in the second etching chemistry in an amount less

than about two percent of gas flow, which is not necessarily present in the other claim groups and not taught by the cited prior art.

**Issue 1: The §103(a) rejection of claims 1 and 3-21 is not proper when the Examiner failed to present correspondence between the instant invention and the proposed modification of the '334 reference and, therefore, failed to establish a *prima facie* case of obviousness.**

A *prima facie* case of obviousness must present complete correspondence between the cited references and the instant invention and present evidence of motivation to modify or combine the cited references. The Office Action dated June 7, 2002 acknowledges that the '334 reference fails to teach the invention as a whole, including use of a second plasma etch using HBr and nitrogen, and the other reference (the '395 reference) fails to teach the use of a second plasma etch using HBr and nitrogen wherein nitrogen is used in an amount less than about ten percent of the gas flow. Accordingly, the Examiner concedes that the cited prior art does not teach the claimed invention as a whole.

At page 4 of the Office Action, the Examiner proposes to cure the above-discussed deficiency by adding nitrogen, which is a carrier gas as taught in the '395 reference, to the second etch chemistry of the '334 reference. This modification of the '334 reference would not achieve correspondence to the claimed invention. At column 17 lines 54 to 65, the '334 reference teaches the use of nitrogen for passivation purposes, where the amount of nitrogen is in excess of twenty percent of the etch gas flow. Thus, any additional nitrogen, as argued by the Examiner, would only serve to increase this percentage. Accordingly, the Examiner's proposed modification would result in the '334 embodiment teaching even further away from and NOT corresponding to the claimed invention.

Also at page 4, the Examiner contradicts the above rationale by arguing that an artisan skilled in the subject matter of the '395 reference would conduct routine experimentation to reduce the amount of nitrogen in the etching chemistry to achieve the limitations of the claimed invention. This suggestion to reduce the amount of nitrogen in the '395 reference is in direct contrast to the above-discussion where the Examiner argues that the nitrogen amount (per the '395 reference) would be increased in the second etch gas of the '334 reference. Appellant respectfully submits that the contradictory rationale is illogical, unexplained, and therefore untenable; as such, this contradictory rationale cannot be

considered as part of this §103 rejection. Accordingly, Appellant maintains that the Examiner's asserted combination of references fails to establish correspondence to Appellant's invention. However, it is conceivable the Examiner has another theory to advance as to why a skilled artisan would first increase the nitrogen amount (via the '395 reference) and then reduce the nitrogen amount by conducting certain experiments. If this is the basis for the rejection, the rejection is improper as discussed in the following issue for failing to clearly state the reasons for rejection as required by 35 U.S.C. §132.

Moreover, in view of the above discussion Appellant submits that the Office Action failed to establish correspondence between the proposed modification of prior art teachings and Appellant's invention as described in the claims of Groups other than claim Groups I and V. With respect to such other pending claims, the Office Action does not even assert correspondence with the cited references. For example, claim groups II and VIII are directed to the use of about two percent of nitrogen gas flow, claim groups III and VI are directed to the mask being a hardmask and made of SiON, and claim groups IV and VII are directed to the use of a selectivity booster. Each claim includes related subject matter not previously recognized by the prior art and explained in the specification, *e.g.*, at pages 10-12. Since no mention is made regarding such aspects of the invention, the necessary correspondence is lacking for a *prima facie* case of obviousness.

In view of the above, the Examiner failed to meet the requirements for establishing a *prima facie* §103(a) rejection. Specifically, no evidence of correspondence between the proposed modification and the claimed invention was presented. Therefore, the §103(a) rejection is improper and must be reversed.

**Issue 2: The §103(a) rejection of the appealed claims 1 and 3-21 is not proper when the Examiner failed to clearly state the reasons for the rejection so as to be useful to Appellant in judging the propriety of the rejection, as required by 35 U.S.C. §132.**

As discussed above, the Examiner failed to clearly state the reasons for rejection as the Office Action presents conflicting modifications, neither of which corresponds to Appellant's invention. As discussed above, at page 4, lines 6-10 of the Office Action, the Examiner argues that the skilled artisan would modify the '334 reference by increasing the nitrogen amount. In the preceding paragraph of the Office Action, the Examiner argues just

the opposite, that the skilled artisan would decrease the nitrogen amount. Because the Examiner has offered no further explanation as to why or for what purpose, Appellant submits that the rationale for the rejection is insufficient to satisfy 35 U.S.C. §132, 37 C.F.R. §1.104 and the M.P.E.P. Without a reasonable presentation of the rationale behind the rejection, Appellant cannot properly judge the propriety of the rejection or make an informed decision with respect to furthering prosecution. In this instance, the Examiner proposes to modify the primary '334 reference with the secondary '395 reference and on the same page attempts to modify the secondary reference. Appellant fails to see how these modifications correspond to the claimed invention and the logic behind them. Appellant requests further clarification should prosecution be reopened and the rejection maintained.

**Issue 3: The §103(a) rejection of claims 1 and 3-21 is not proper when the Examiner failed to take note of Appellant's arguments presented in the Office Action Response filed on July 2, 2001 and answer the substance thereof, as required by M.P.E.P. §707.07(f).**

The Examiner failed to address the traversal of the asserted combination of the '334 reference with the '395 reference as presented by Appellant in the Advisory Action Response filed on July 2, 2001. M.P.E.P. §707.07(f) states, in pertinent part, the following:

Where the requirements are traversed, or suspension thereof requested, the examiner should take proper reference thereto in his or her action on the amendment. Where the applicant traverses any rejection, the examiner should, if he or she repeats the rejection, take note of the applicant's argument and answer the substance of it. If a rejection of record is to be applied to a new or amended claim, specific identification of that ground of rejection, as by citation of the paragraph in the former Office letter in which the rejection was originally stated, should be given.

In this regard, M.P.E.P. §707.07(f) indicates that the Examiner should take note of the Appellant's argument regarding the impropriety of the asserted combination and answer the substance of it. This is consistent with the purpose of aiding the Appellant in judging the propriety of continuing the prosecution, as indicated in 37 C.F.R. §1.104(a)(2).

In this instance, the Examiner did not comply with this requirement, and Appellant was not afforded the opportunity to judge the propriety of the §103(a) rejection and to form a response thereto. First, the Examiner failed to respond to Appellant's argument that the instant invention must be examined "as a whole." Appellant argued that the discovery of a

source of a problem, here the notching effect, is part of the invention “as a whole” and must be considered in determining obviousness. M.P.E.P. §2112.02. As such, an artisan skilled in the art of the ‘334 reference would not pursue reducing the amount of nitrogen through routine experimentation, as claimed in the Office Action, since such artisan would be unaware of the objective of the instant invention and such artisan would have no reason (motivation) to pursue this objective. Rather, the skilled artisan would be conducting routine experimentation to achieve the objective of the ‘334 reference, which is to use nitrogen for its passivating properties; the nitrogen amount for passivation would not (under any such circumstances) be reduced to less than about ten percent, as claimed in independent claims 1, 8 and 18, or less than about two percent of the gas flow, as claimed in claims 3 and 16.

In any event, the Examiner was obligated to respond to Appellant’s argument that the invention must be examined “as a whole.” Therefore, Appellant requests that the finality of the Office Action mailed on June 7, 2002 be removed, that the Examiner address Appellant’s arguments and that the Appellant have an opportunity to respond thereto, should the rejection be maintained.

**Issue 4: The §103(a) rejection of claims 1 and 3-21 is not proper when the Examiner failed to cite evidence of motivation for modifying the ‘334 reference or the proposed modification undermines the purpose of the ‘334 reference and, therefore, failed to establish a *prima facie* case of obviousness.**

**A. Lack Of Actual Evidence Of The Alleged Motivation**

The law indicates that identification of the problem being addressed is an important part of the statutory requirement that the invention be considered “as a whole” when evaluating whether or not §103(a) applies. *See, e.g., Graham v. John Deere Co.*, 383 U.S. 1, 86 S. Ct. 684, 15 L. Ed. 2d 545; 148 U.S.P.Q. 459 (1966). Additional case law in this regard is provided in the M.P.E.P. For example, M.P.E.P. §2112.02 clearly states that, “The discovery of a new use for an old structure based on unknown properties of the structure might be patentable to the discoverer as a process of using.” It further provides that “[A] patentable invention may lie in the discovery of the source of a problem even though the remedy may be obvious once the source of the problem is identified. This is part of the ‘subject matter as a whole’ which should always be considered in determining the



obviousness of an invention under 35 U.S.C. §103." MPEP § 2141.02. In this instance, Appellant has provided a clear assertion of a discovery which addresses a significant problem in the field of semiconductor processing. The specification at page 5, lines 10-12 states: "it has been discovered that adding a small amount of nitrogen during the endpoint stop prevents the notch without affecting selectivity." The notching effect is described and illustrated in connection with Figure 1 and Appellant's discovery is further explained in the Summary and the Detailed Description (e.g., page 10, lines 4-8). The use of nitrogen to prevent notching addresses a different objective than the endpoint identification of the prior art. Therefore, an artisan skilled in the subject matter of the '334 reference would not pursue reducing the amount of nitrogen through routine experimentation, as claimed, since such artisan is unaware of the objective of the instant application, and therefore has no reason (motivation) to pursue this objective.

Appellant respectfully submits that the present rejection is one of classic hindsight reconstruction. Combining limitations without evidence of such a suggestion, teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability - the essence of hindsight. *See, e.g., Interconnect Planning Corp v. Feil*, 774 F.2d 1132, 1138, 227 U.S.P.Q. 543, 547 (Fed. Cir. 1985) ("The invention must be viewed not with the blueprint drawn by the inventor, but in the state of the art that existed at the time.") It is for this reason that the Court of Appeals has repeatedly indicated that there must be adequate evidence to corroborate the alleged motivation to modify the teachings of the prior art. Without such evidence, for almost every patent application based on previously known matter, the prior art could be used to reconstruct the invention claimed. The law, however, has safeguards against such Patent Office practice.

There must be evidence in the cited prior art to corroborate the alleged motivation to modify the teachings of the prior art. *See, e.g., In re Dembiczak*, 175 F.3d 994, 50 U.S.P.Q.2d 1614 (Fed. Cir. 1999), *Ruiz v. A.B. Chance Co.*, 234 F.3d 654, 57 U.S.P.Q.2d 1161 (Fed. Cir. 2000), that the alleged motivation for combining the references is to be suggested by the **references** ("Our court has provided [that the] motivation to combine may be found explicitly or implicitly: 1) in the **prior art references** themselves; 2) in the knowledge of those of ordinary skill in the art that certain **references**, or disclosures in those references, are of special interest or importance in the field; or 3) from the nature of the

problem to be solved, ‘leading inventors to look to *references* relating to possible solutions to that problem.’”).

Appellant respectfully submits that the Examiner has failed even to establish a *prima facie* case since no evidence of motivation has been cited.

B. Routine Experimentation Would Lead to a Different Result

In an attempt to overcome the deficient (as discussed above) prior art teachings, after reading Appellant’s Specification and Appellant’s discovery for addressing the notching problem, the Examiner alleges that one skilled in the art would read the ‘395 reference to modify the teaching of the ‘334 reference by teaching from the ‘395 patent. Appreciating that there must be some motivation for modifying the prior art, the Examiner explains that the skilled artisan would be motivated somehow through “routine experimentation” and/or to achieve “a reasonable degree of success.” Interestingly, the Examiner does not explain or even acknowledge the purpose for this “routine experimentation” or what the prior art is trying to achieve in order to consider the experimentation efforts to correspond to any “degree of success.” An artisan skilled in the art of the ‘334 reference would not, in fact, pursue reducing the amount of nitrogen through routine experimentation since such artisan would be unaware of the objective of the instant invention and such artisan would have no reason (motivation) to pursue this objective. Rather, the skilled artisan would be conducting routine experimentation to achieve the objective of the ‘334 reference as discussed in the above issue.

In summary, it is untenable for the Examiner to equate Appellant’s invention to unrelated art which is directed to achieving completely different goals: any alleged “routine experimentation” would clearly be directed away from Appellant’s claimed invention.

C. The Proposed Modification Would Teach Away from the Claimed Invention

There is no evidence of motivation in the prior art references that would lead the skilled artisan to combine the references. The ‘334 reference includes nitrogen for its passivating properties to further anisotropic etching results and one skilled in the art would not be motivated to add the nitrogen of the ‘395 reference since the ‘395 reference teaches that nitrogen is inert. Further, there would be no motivation to decrease the amount of nitrogen in the ‘334 reference to reach the less than about ten percent of the gas flow since the ‘334 reference appreciates the passivating properties of the nitrogen. Moreover, adding

any additional inert nitrogen from the '395 reference to the carrier gas of the '334 reference would increase the concentration of nitrogen in the total gas flow, teaching away from the claimed invention.

The Examiner's attempt to find the requisite correspondence between the asserted prior art and the claimed invention through a modification of the '334 reference with the '395 reference is improper as the modification would undermine the purpose of the '334 reference. Relevant case law indicates that, where an asserted modification of a primary reference would render that reference unsatisfactory for its intended purpose, there is no motivation to make the modification (*see, e.g., In re Gordon*, 733 F.2d 900, 221 U.S.P.Q. 1125 (Fed. Cir. 1984)). The '334 reference includes nitrogen in the second etching stage for nitrogen's passivating properties to further anisotropic etching results. The nitrogen of the '395 reference is used as an inert carrier gas. In this instance, the asserted modification of the '334 reference to include the inert-nitrogen amounts, used for "carrier" purposes, would undermine the '334 reference's intended purpose of using nitrogen for its passivating properties (*see, e.g., '334 reference*, column 1 lines 19-22). Additionally, there is no suggestion, other than Appellant's disclosure, to use nitrogen in an amount less than about ten percent of the gas flow. In this regard, the asserted modification(s) of the '334 reference lacks motivation and, in relying on the modification, the Examiner has failed to establish a *prima facie* case of obviousness. Therefore, Appellant requests that the §103(a) rejection of the claims be reversed.

In view of the above, the Examiner failed to meet the requirements for establishing a *prima facie* §103(a) rejection. Specifically, no evidence of motivation was presented that would lead the skilled artisan to combine the cited references. Therefore, the §103(a) rejection is improper and must be reversed.

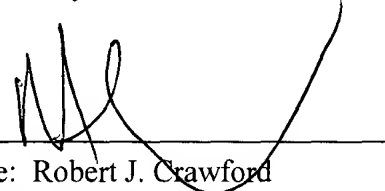
**IX. Conclusion**

In view of the above, Appellant believes the claimed invention to be patentable. Claims 1 and 3-21 remain for consideration. Appellant respectfully requests reversal of the rejection as applied to the appealed claims and allowance of the entire application.

Please charge Deposit Account No. 50-0996 (VLSI.268PA) in the amount of \$320.00 for filing a Brief in support of an appeal as set forth in §1.17(c).

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Respectfully submitted,

By:   
Name: Robert J. Crawford  
Reg. No. 32,122

## APPENDIX OF APPEALED CLAIMS (09/437,006)

1. A process of forming a semiconductor device, comprising:  
forming at least one device layer over a wafer surface;  
providing a mask over a portion of the device layer; and  
using a plasma-etch using first and second etching chemistries, and selectively etching into the device layer to form a pillar structure having at least one sidewall, the selective etching including use of nitrogen in an amount less than about ten percent of gas flow in a second etching chemistry, as part of the plasma etch in the second chemistry.
3. A process of forming a semiconductor device, according to claim 1, wherein the second chemistry includes nitrogen in an amount less than about two percent of gas flow in the second chemistry.
4. A process of forming a semiconductor device, according to claim 1, wherein the second chemistry includes a diluted gas mixture of nitrogen.
5. A process of forming a semiconductor device, according to claim 1, wherein the device layer is polysilicon, and the second chemistry includes in an amount less than about ten percent of gas flow in the second chemistry.
6. A process of forming a semiconductor device, according to claim 5, wherein the mask is a hardmask, and the first chemistry includes one of HBr/ Cl<sub>2</sub>, HBr/HCl, or HBr/ Cl<sub>2</sub>/ Cl<sub>4</sub>.
7. A process, according to claim 6, wherein the first chemistry further includes the first chemistry also includes a selectivity booster.
8. A process of forming a semiconductor device, comprising:  
forming at least one device layer over an underlying dielectric layer, the device layer and the underlying dielectric layer being over a wafer surface;  
providing a mask over a portion of the device layer;

a step of using a plasma-etch of a first chemistry and selectively etching into the device layer for a function of forming a pillar structure having at least one sidewall; and

after the step of using the first chemistry, using a step of using a plasma-etch of a different second chemistry that includes less than about ten percent nitrogen of gas flow in the second chemistry for a function of completing the selective etching upon etching up to the underlying dielectric layer.

9. A process, according to claim 8, wherein the device layer includes at least one of: a layer of polysilicon; and an anti-reflective coating on a layer of polysilicon.

10. A process, according to claim 8, wherein the device layer is polysilicon and the pillar structure is a gate electrode.

11. A process, according to claim 10, wherein the mask is a hardmask.

12. A process, according to claim 11, wherein the mask is formed using SiON.

13. A process, according to claim 12, wherein the first chemistry includes HBr/Cl<sub>2</sub>, and a selectivity booster.

14. A process, according to claim 12, wherein the first chemistry includes at least one of HBr/Cl<sub>2</sub> and HBr/ Cl<sub>2</sub>/ Cl<sub>4</sub>

15. A process, according to claim 14, wherein the second chemistry includes nitrogen in an amount less than about ten percent of gas flow in the second chemistry, and wherein the second chemistry includes a diluted gas mixture of nitrogen.

16. A process, according to claim 8, wherein the second chemistry includes nitrogen in an amount less than about two percent of gas flow in the second chemistry.

17. A process, according to claim 8, wherein the second chemistry includes nitrogen in an amount less than about ten percent of gas flow in the second chemistry.
18. A process of forming a semiconductor device, comprising:  
forming at least one gate electrode layer over a gate oxide, the gate oxide being above a wafer surface;  
providing a hardmask over a portion of the device layer;  
using a plasma-etch of a first chemistry that includes HBr and selectively etching into the device layer to form a pillar structure having at least one sidewall;  
after using the first chemistry, using a plasma-etch of a different second chemistry that includes HBr and nitrogen and selectively etching into the device layer to form a pillar structure having at least one sidewall, the second chemistry including nitrogen in an amount less than about ten percent of gas flow of the second chemistry; and  
terminating the use of a plasma-etch of the second chemistry in response to reaching the gate oxide.
19. A process, according to claim 18, wherein the first chemistry includes one of HBr/Cl<sub>2</sub>, HBr/HCl, or HBr/Cl<sub>2</sub>/Cl<sub>4</sub>, and also includes a selectivity booster.
20. A process, according to claim 18, wherein the first chemistry includes HBr/Cl<sub>2</sub> and He-O<sub>2</sub>.
21. A process, according to claim 18, wherein the second chemistry includes a diluted gas mixture of nitrogen.

## Appendix B

### Ownership of VLSI Technology, Inc.

- B1). Philips Semiconductors, Inc Secretary's Certificate of May 17, 2000.
- B2). Certificate of "Name Change" Amendment of Certificate of Incorporation of July 2, 1999.
- B3). Certificate of Merger of Philips Semiconductors, Inc. and Philips Semiconductors VLSI Inc.
- B4). Philips Semiconductors, Inc. Secretary's Certificate of May 16, 2000.
- B5). State of Delaware Secretary of State certifying the "Name Change" Amendment of B2.
- B6). State of Delaware Secretary of State certifying the Certificate of Merger of B3.
- B7). Philips Semiconductors, Inc. Secretary's Certificate of July 6, 2000 showing ownership of Philips Semiconductors Inc.

### Authorized Signatories

- B8). Secretary's Certification authorizing Michael Schmitt et al to sign on behalf of Philips Semiconductors, Inc.
- B9). Secretary's Certification authorizing Michael Schmitt et al to sign on behalf of U.S. Philips Corporation.
- B10). Secretary's Certification authorizing Michael Schmitt et al to sign on behalf of Philips North America Corporation
- B11). Power of Attorney authorizing Michael Schmitt et al to sign on behalf of Koninklijke Philips Electronics N.V.




## SECRETARY'S CERTIFICATE

I, W. T. OATES, JR., Secretary of Philips Semiconductors Inc., do hereby certify:

1. that attached is a true and correct copy of Certificate of Amendment of Certificate of Incorporation as filed with the Secretary of State of the State of Delaware on July 2, 1999 changing the name of VLSI Technology, Inc. to Philips Semiconductors VLSI Inc.
2. that attached is a true and correct copy of Certificate of Merger merging Philips Semiconductors Inc. into Philips Semiconductors VLSI Inc. and change of name of survivor Philips Semiconductors VLSI Inc. to Philips Semiconductors Inc. as filed with the Secretary of State of the State of Delaware on December 29, 1999.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the Corporate Seal  
on May 17, 2000.

  
Secretary

STATE OF DELAWARE  
SECRETARY OF STATE  
DIVISION OF CORPORATIONS  
FILED 09:00 AM 07/02/1999  
991273471 - 2125539

CERTIFICATE OF AMENDMENT  
OF  
CERTIFICATE OF INCORPORATION

\*\*\*\*\*

VLSI Technology, Inc., a corporation organized and existing under and by virtue of the General Corporation Law of the State of Delaware, DOES HEREBY CERTIFY:

FIRST: That the Board of Directors of VLSI Technology, Inc., by unanimous written consent of its members, filed with the minutes of the board, duly adopted resolutions setting forth a proposed amendment to the Certificate of Incorporation of said corporation, declaring said amendment to be advisable:

RESOLVED, that the Certificate of Incorporation of this Corporation be amended by changing the first Article thereof so that, as amended, said Article shall be and read as follows:

"FIRST. The name of the Corporation is PHILIPS SEMICONDUCTORS VLSI INC."

SECOND: That in lieu of a meeting and vote of stockholders, the stockholders have given unanimous written consent to said amendment in accordance with the provisions of Section 228 of the General Corporation of the State of Delaware.

THIRD: That the aforesaid amendment was duly adopted in accordance with the applicable provisions of Section 242 and 228 of the General Corporation Law of the State of Delaware.

IN WITNESS WHEREOF, said VLSI Technology, Inc. has caused this certificate to be signed by Paul S. Friedlander, its Vice President and attested by Warren T. Oates, Jr., its Assistant Secretary this 2nd day of July, 1999.

VLSI TECHNOLOGY, INC.

By: 

Vice President

ATTEST:

  
Assistant Secretary

STATE OF DELAWARE  
SECRETARY OF STATE  
DIVISION OF CORPORATIONS  
FILED 09:00 AM 12/29/1999  
991566771 - 2125539

CERTIFICATE OF MERGER

OF

PHILIPS SEMICONDUCTORS INC.

AND

PHILIPS SEMICONDUCTORS VLSI INC.

It is hereby certified that:

1. The constituent business corporations participating in the merger herein certified are:

Philips Semiconductors Inc., which is incorporated under the laws of the State of Delaware; and

Philips Semiconductors VLSI Inc., which is incorporated under the laws of the State of Delaware.

2. An Agreement of Merger has been approved, adopted, certified, executed, and acknowledged by each of the aforesaid constituent corporations in accordance with the provisions of subsection (c) of Section 251 of the General Corporation Law of the State of Delaware.

3. The name of the surviving corporation in the merger herein certified is Philips Semiconductors VLSI Inc., which will continue its existence as said surviving corporation under the name Philips Semiconductors Inc. upon the effective date of said merger pursuant to the provisions of the General Corporation Law of the State of Delaware.

4. The Certificate of Incorporation of Philips Semiconductors VLSI Inc. is to be amended and changed by reason of the merger herein certified by striking out Article FIRST, relating to the name, by substituting in lieu thereof the following article:

"FIRST: The name of the Corporation is PHILIPS SEMICONDUCTORS INC."

and said Certificate of Incorporation as so amended and changed shall continue to be the Certificate of Incorporation of said surviving corporation until further amended and changed in accordance with the provisions of the General Corporation Law of the State of Delaware.

5. The executed Agreement of Merger between the aforesaid constituent corporations is on file at an office of the aforesaid surviving corporation, the address of which is as follows: 1251 Avenue of the Americas, New York, NY 10020

6. A copy of the aforesaid Agreement of Merger will be furnished by the aforesaid surviving corporation, on request, and without cost, to any stockholder of each of the aforesaid constituent corporations.

7. The Agreement of Merger between the aforesaid constituent corporations provides that the merger herein certified shall be effective at 12:02 a.m. January 1, 2000 Pacific Standard Time.

Dated: December 20, 1999

PHILIPS SEMICONDUCTORS INC.

By:

  
(Name, Title) Belinda W. Chew, Vice President

Dated: December 20, 1999

PHILIPS SEMICONDUCTORS VLSI INC.


By:

  
(Name, Title) Warren T. Oates, Jr., Vice President

## SECRETARY'S CERTIFICATE

I, W. T. OATES, JR., Secretary of Philips Semiconductors Inc., do hereby certify that the attached is a true and correct copy of Certificate of Merger merging Philips Semiconductors Inc. into Philips Semiconductors VLSI Inc. and change of name of survivor Philips Semiconductors VLSI Inc. to Philips Semiconductors Inc. as filed with the Secretary of State of the State of Delaware on December 29, 1999.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the Corporate Seal  
on May 16, 2000.

  
Secretary

State of Delaware  
Office of the Secretary of State

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PAGE 1

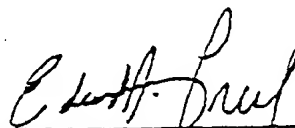
I, EDWARD J. FREEL, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF MERGER, WHICH MERGES:

"PHILIPS SEMICONDUCTORS INC.", A DELAWARE CORPORATION,  
WITH AND INTO "PHILIPS SEMICONDUCTORS VLSI INC." UNDER THE NAME OF "PHILIPS SEMICONDUCTORS INC.", A CORPORATION ORGANIZED AND EXISTING UNDER THE LAWS OF THE STATE OF DELAWARE, AS RECEIVED AND FILED IN THIS OFFICE THE TWENTY-NINTH DAY OF DECEMBER, A.D. 1999, AT 9 O'CLOCK A.M.

AND I DO HEREBY FURTHER CERTIFY THAT THE EFFECTIVE DATE OF THE AFORESAID CERTIFICATE OF MERGER IS THE FIRST DAY OF JANUARY, A.D. 2000.

A FILED COPY OF THIS CERTIFICATE HAS BEEN FORWARDED TO THE NEW CASTLE COUNTY RECORDER OF DEEDS.



  
Edward J. Freel, Secretary of State

2125539 8100M

AUTHENTICATION: 0172467

DATE: 12-30-99

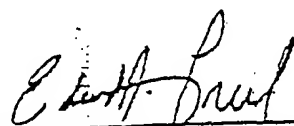
State of Delaware  
*Office of the Secretary of State* PAGE 1

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I, EDWARD J. FREEL, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF AMENDMENT OF "VLSI TECHNOLOGY, INC.", CHANGING ITS NAME FROM "VLSI TECHNOLOGY, INC." TO "PHILIPS SEMICONDUCTORS VLSI INC.", FILED IN THIS OFFICE ON THE SECOND DAY OF JULY, A.D. 1999, AT 9 O'CLOCK A.M.

A FILED COPY OF THIS CERTIFICATE HAS BEEN FORWARDED TO THE NEW CASTLE COUNTY RECORDER OF DEEDS.



  
Edward J. Freel, Secretary of State

2125539 8100

AUTHENTICATION: 9846969

DATE: 07 02 99

## SECRETARY'S CERTIFICATE

I, W. T. OATES, JR., Secretary of Philips Semiconductors Inc., do hereby certify:

1. Philips Semiconductors Inc. is a wholly-owned subsidiary of Philips Holding USA Inc.;
2. Philips Holding USA Inc. is a wholly-owned subsidiary of Koninklijke Philips Electronics N.V.;

IN WITNESS WHEREOF, I have hereunto signed my name and affixed the Corporate Seal at New York, New York, this 6<sup>th</sup> day of July, 2000.



Secretary




## SECRETARY'S CERTIFICATION

I, Warren T. Oates, Jr., Secretary of Philips Semiconductors Inc., do hereby certify that the following resolution was duly adopted by the Board of Directors of this Corporation on April 17, 2001 and such resolution has not been modified or rescinded and is in full force and effect as of the date of this certificate:

RESOLVED, that effective April 1, 2001, Matthieu van Kaam, Michael Marion, Jack Haken or Michael Schmitt be and they individually are authorized as "Authorized Signatory(ies) to sign, execute and deliver on behalf of the Corporation, all instruments relating to patents, trademarks, or copyright registrations, all license agreements, all petitions, powers of attorney, authorizations, verifications, nominations of representatives, declarations and other instruments relating to proceedings with respect to patents, trademarks or copyrights in the Patent, Trademark Registration or Copyright Offices of any country in the world, or relating to appeal proceedings of that nature and assignments of rights to patents, trademark registrations and copyrights.

IN WITNESS WHEREOF, I have signed my name and affixed the Corporate Seal at New York, N.Y., this 30th day of May, 2001.

  
Secretary


## SECRETARY'S CERTIFICATION

I, Warren T. Oates, Jr., Assistant Secretary of U.S. Philips Corporation. (the "Corporation"), do hereby certify that the following resolution was duly adopted by the Board of Directors of this Corporation on May 23, 2001 and is in full force and effect as of the date of this certificate:

INTELLECTUAL PROPERTY AUTHORITY

RESOLVED, that effective April 1, 2001, Matthieu van Kaam, Michael Marion, Jack Haken or Michael Schmitt be and they individually are authorized as "Authorized Signatory(ies)" to sign, execute, and deliver on behalf of the Corporation, all instruments relating to patents, trademarks, or copyright registrations, all license agreements, all petitions, powers of attorney, authorizations, verifications, nominations of representatives, declarations and other instruments relating to proceedings with respect to patents, trademarks or copyrights in the Patent, Trademark Registration or Copyright Offices of any country of the world, or relating to appeal proceedings of that nature and assignments of rights to patents, trademark registrations and copyrights.

IN WITNESS WHEREOF, I have signed my name and affixed the Corporate Seal at New York, N.Y., this 21st day of June, 2001.

  
\_\_\_\_\_  
Assistant Secretary

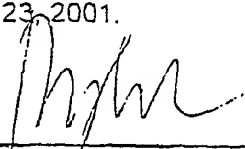
PHILIPS ELECTRONICS NORTH AMERICA CORPORATION

Consent of Directors to Action Taken  
Without a Meeting of the Board of Directors

The undersigned, being all the members of the Board of Directors of PHILIPS ELECTRONICS NORTH AMERICA CORPORATION (the "Corporation"), a Delaware corporation pursuant to Section 141(f) of the General Corporation Law of the State of Delaware, hereby unanimously consent to the adoption of the following resolution without a meeting:

RESOLVED, that Matthieu van Kaam, Michael Marion, Jack Haken or Michael Schmitt be and they individually are authorized as "Authorized Signatory(ies)" to sign, execute, and deliver on behalf of the Corporation, all instruments relating to patents, trademarks, or copyright registrations, all license agreements, all petitions, powers of attorney, authorizations, verifications, nominations of representatives, declarations and other instruments relating to proceedings with respect to patents, trademarks or copyrights in the Patent, Trademark Registration or Copyright Offices of any country of the world, or relating to appeal proceedings of that nature and assignments of rights to patents, trademark registrations and copyrights, with immediate effect.

IN WITNESS WHEREOF, the undersigned Directors have executed this Consent as of April 23, 2001.

  
\_\_\_\_\_  
Belinda W. Chew  
\_\_\_\_\_  
William E. Curran



# PHILIPS

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## Koninklijke Philips Electronics N.V.

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P.O. Box 220, 5600 AE Eindhoven, The Netherlands

### POWER OF ATTORNEY

The undersigned, Koninklijke Philips Electronics N.V. of Eindhoven, The Netherlands (hereinafter referred to as "the company") for the present purpose represented by Mr. R.J. Peters, authorized representative of the company, hereby grants authority until further notice to Messrs.

M.J.M. van Kaam  
J.E. Haken  
M.E. Marion  
M.E. Schmitt

to act jointly and severally, within the normal performance of their duties, as representatives of the company at law and otherwise, with full power of substitution and revocation in all matters relating to the establishment, acquisition, maintenance, defence and administration of the company's rights and/or titles with respect to patents of inventions, utility models, trademarks, topographies of semiconductor products, drawings (including packaging designs) and industrial designs and/or applications for these, domain names, as well as computer software, and the contestation (including the institution of actions for nullity) of applications and rights of third parties and in all matters relating to the transfer and assignment of such rights and/or titles in the framework of divestiture of lines of business which explicitly have been resolved by the Board of Management of the company.

Eindhoven, 15<sup>th</sup> May 2001

Koninklijke Philips Electronics N.V.

R.J. Peters